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A New Species of *Breutelia* (Bartramiaceae) from Central America,
with a Key to the Species of *Breutelia* in Central America

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ABSTRACT. *Breutelia pilifera* differs from all other species of *Breutelia* by its non-sheathing leaves that have costae excurrent into long, naked awns and reddish orange basal leaf cells across the leaf insertion. A key to the 14 species of *Breutelia* in Central America is given.

Breutelia is a robust genus found mostly at high elevations in the Neotropics. The genus has some distinctive, easy to recognize species, but most are taxonomically difficult. Two characters of critical taxonomic importance are leaf stance and the degree or type of alar region differentiation. Unfortunately, proper character-state evaluation of these features often requires previous familiarity with the genus. There are two basic leaf stances: spreading from the insertion and sheathing at the base. This leaf stance distinction is used in the beginning of many keys to the species of *Breutelia* (Bartram, 1949; Griffin, 1994; Churchill & Linares, 1995). It works tolerably well, but for some species it is difficult to evaluate because the two forms grade into one another and sometimes both can be found within single collections. Likewise, the degree or type of alar region differentiation, which often involves subtle distinctions, can be difficult to evaluate because of variation both within and among collections. Proper evaluation of this last feature requires the examination of many leaves.

Breutelia has an odd endostome structure that

helps to bind the Bartramiaceae together. In those members of the family with a well-developed endostome the segments are broad and when examined with a hand lens appear to be positioned opposite to rather than alternating with the exostome teeth. Closer examination reveals each segment is split along the median line nearly to the basal membrane, and each half segment diverges outward toward the cilia where it often meets the diverging half segment of the next segment over, thus framing the cilia (see Fig. 1B). This endostome structure is sometimes inaccurately noted in the literature as "cilia cohering" (Zales, 1973); however, Shaw and Rohrer (1984) correctly evaluated the structure. Within the Bartramiaceae this type of endostome is found in *Bartramia*, *Breutelia*, *Philonotis*, and *Plagiopus*. Curiously, similar endostomial modification is found in the Bryaceae (*Acidodontium* and *Brachymenium columbicum* (De Notaris) Brotherus).

Breutelia is closely related to *Philonotis*, and although the two genera are generally easy to distinguish due to the larger size of *Breutelia*, technically they are difficult to separate. Sporophytically, the genera are identical; gametophytically, only the larger size, generally narrower and longer leaf cells, consistently plicate leaf bases, and differentiated alar cells of *Breutelia* separate the two genera. However, *Philonotis* approximates *Breutelia* in all of these features; even their size distinction is

blurred, since large plants of *Philonotis sphaericarpa* (Hedwig) Bridel and small plants of *Breutelia jamaicensis* (Mitten) A. Jaeger overlap in size.

There are 14 species of *Breutelia* in Central America, one of which is described below as new to science, in preparation for the next volume of the *Moss Flora of Central America* (Allen, 1994).

Breutelia pilifera B. H. Allen & D. G. Griffin, sp. nov. TYPE: Costa Rica. Cartago: Tapantí Forest Reserve ca. 25 km SE of Cartago, *Griffin & Eakin 196* (holotype, MO-4410818; isotypes, F, FLAS, NY, US). Figure 1A–H.

Species foliis habentibus aristis longis (0.6–0.8 mm) nudis a congeneribus differt.

Plants medium- to large-sized, yellowish green above, glossy, in loose tufts to 70 mm high. Stems red, in cross section hyalodermis present, central strand well developed; densely tomentose below, rhizoids reddish brown, smooth. Leaves 3–4 mm long, widely spaced, spreading from base, stiffly erect-incurved above, apices not twisted when dry, erect-spreading when wet, straight, occasionally falcate, ovate-lanceolate, long, slenderly acuminate, not or weakly plicate at base, not decurrent; margins plane to narrowly recurved at midleaf, serrulate; costa long excurrent into a long, naked awn, 0.6–0.8 mm long; leaf cells straight-walled, strongly papillose from the upper end, upper cells linear-elongate, firm-walled, $30\text{--}50 \times 2.5\text{--}3.7 \mu\text{m}$, lower cells linear-elongate, $55\text{--}75 \times 2.5\text{--}3.7 \mu\text{m}$, firm-walled; leaf base entirely orange to reddish yellow, alar region with small cluster (8–15) of enlarged, thin-walled cells at basal angle. Dioicous. Perigonia discoid. Setae flexuose, 25–30 mm long; capsules inclined, asymmetric, 2.5–3 mm long, subglobose, furrowed when dry, striate when wet, exothecial cells firm- to thick-walled, stomata immersed, numerous at base; operculum plano-convex; exostome teeth red, triangular, finely papillose below, coarsely papillose near tips, dorsal trabeculae faint, ventral trabeculae strongly thickened; endostome segments broad, yellow, papillose, segments split along the median line and each half diverging toward the cilia, cilia rudimentary 0–2. Spores reniform, 17–23 μm , faintly papillose, pale yellow.

Habitat. Lower montane rainforest, epilithic on wet rocky roadside embankment; 1000–1800 m.

Breutelia pilifera is a medium- to large-sized species known only from two collections, both made in the Tapantí Forest Reserve of Costa Rica. It has densely tomentose stems, a shiny, yellow-green color with widely spaced leaves that spread from the

base and are stiffly erect-incurved above, which give the plants a “worm-like” aspect not seen in any other Central American species of *Breutelia*. Its most distinctive features are found in its costa, which is long excurrent into a naked awn, and its leaf base, which is orange or reddish yellow throughout. No other species of *Breutelia* has this combination of features. In Central America no other species has a costa as strongly excurrent as that of *B. pilifera*. The only other Central American species of *Breutelia* with an orange to reddish yellow leaf base is *B. reclinata* Brotherus. That species differs from *B. pilifera* in having much larger leaves (8–9 mm long) that are tightly sheathing at base, and a percurrent to shortly excurrent costa. The leaf cells of *B. pilifera* are straight-walled and very strongly papillose by projecting upper cell end-walls.

Breutelia pilifera differs from most members of *Breutelia* in having faintly papillose rather than warty-tuberculose spores. Faintly papillose spores are common in *Philonotis*, and the same spore ornamentation is found in *Breutelia jamaicensis*, which otherwise is distinctly philonotoid in aspect. Interestingly, however, *B. affinis* (Hooker) Mitten, another species with a philonotoid aspect, has warty spores.

The type of *B. pilifera* was originally distributed by the Moss Exchange of the American Bryological and Lichenological Society as *B. jamaicensis*. These specimens do not bear a collection number; instead, they have the herbarium number 019961. The only type specimens we examined that have the collection number 196 are the holotype (MO) and one isotype (FLAS).

Paratype. COSTA RICA. **Cartago:** Reserva de Tapantí, Gómez 18861 (CR, MO).

KEY TO THE SPECIES OF *BREUTELIA* IN CENTRAL AMERICA

1. Leaf base tightly sheathing 2
- 1'. Leaf loosely appressed or erect at base to wide-spreading from the insertion 6
- 2(1). Leaves to 9 mm long; orange at base; alar cells undifferentiated, consisting of elongate, porose cells . . . *B. reclinata* Brotherus
- 2'. Leaves to 7 mm long; hyaline at base, reddish orange only at insertion line; alar cells strongly differentiated or with at least 2–4 enlarged cells along the basal margin and a marginal row of enlarged rectangular cells 3
- 3(2). Alar cells greatly enlarged, thin-walled and bulging in 4–7 rows, extending nearly to leaf shoulders; leaf margins broadly revolute at shoulders; leaves without groups of short lax cells at top of basal plications
. *B. inclinata* (Hampe & Lorentz) A. Jaeger

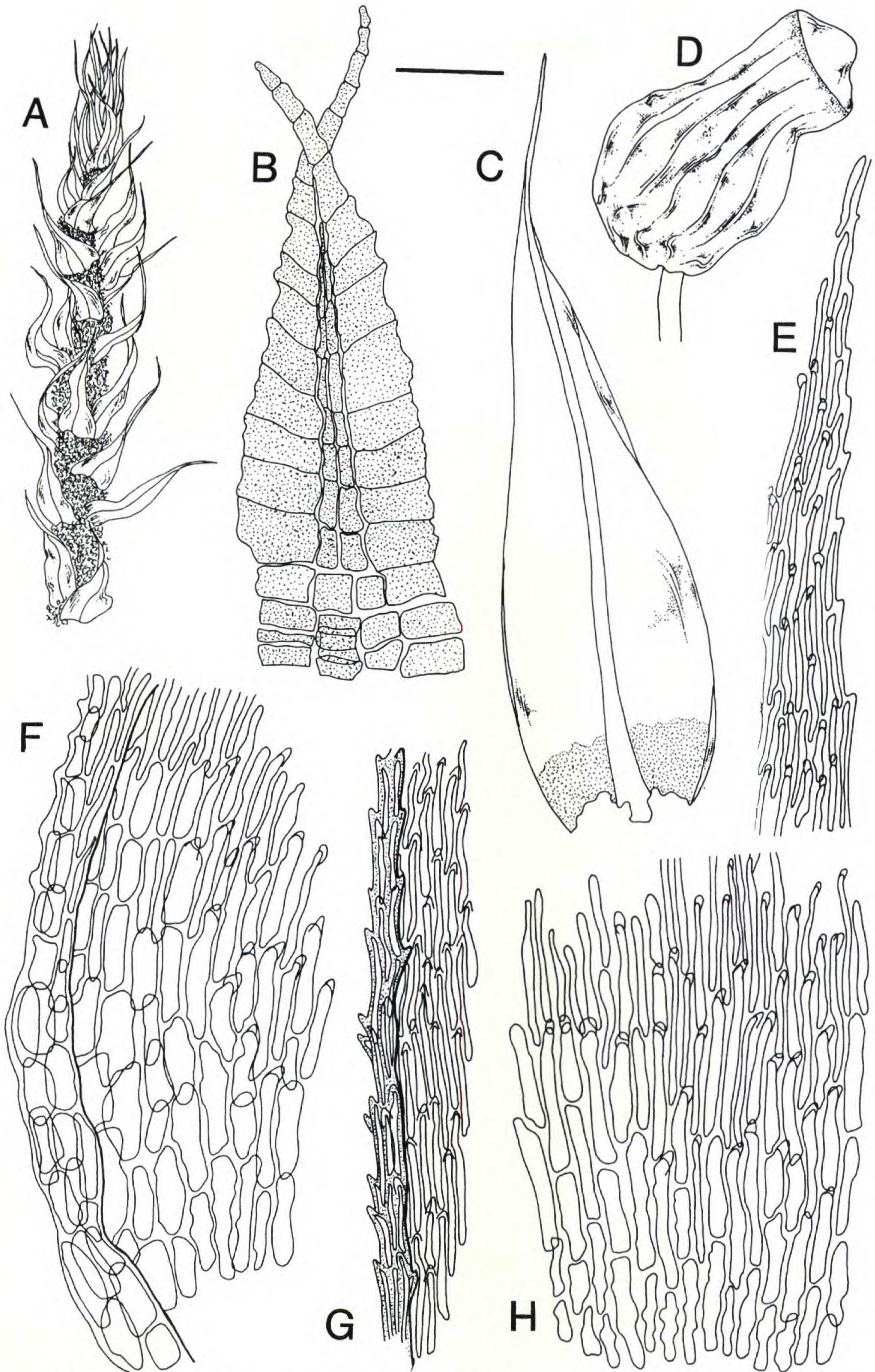


Figure 1. *Breutelia pilifera* B. H. Allen & D. G. Griffin. —A. Habit. —B. Part of the endostome ventral (inner) surface. —C. Leaf. —D. Capsule and operculum. —E. Upper leaf cells at margin. —F. Basal leaf cells in alar region. —G. Median leaf cells at margin. —H. Inner basal leaf cells near costa. Scale in mm: bar = 0.05 (E–H); bar = 0.1 (B); bar = 0.55 (C); bar = 1.3 (D); bar = 1.78 (A). All figures from *Griffin & Eakin 196* (MO).

- 3'. Alar cells somewhat enlarged, thin-walled to firm-walled; leaf margins plane or narrowly revolute; leaves often with groups of short lax cells at top of basal plications 4
- 4(3). Leaves erect-appressed to erect with divaricate tips when dry
 *B. polygastrica* (Carl Müller) Brotherus
- 4'. Leaves squarrose, deflexed, or wide-spreading, never erect-appressed 5
- 5(4). Alar region with 4–6 rows of enlarged, lax, hyaline cells extending well up the leaf margin
 *B. austro-arcuata* (Carl Müller) Paris
- 5'. Alar region with 2–4 enlarged cells along the basal margin and a marginal row of enlarged subrectangular to rectangular cells
 *B. brittoniae* Renaud & Cardot
- 6(1). Costa excurrent into a long, naked, awn to 1 mm long; entire leaf base orange to reddish yellow
 *B. pilifera* B. H. Allen & D. G. Griffin
- 6'. Costa percurrent or short excurrent; only the alar region and the area near the leaf insertion orange or reddish 7
- 7(6). Leaves erect-appressed; marginal basal cells quadrate in 5–10 rows, inner basal cells short-rectangular to quadrate
 *B. jamaicensis* (Mitten) A. Jaeger
- 7'. Leaves spreading or erect at base, falcate or squarrose; marginal basal cells enlarged and lax, or undifferentiated, inner basal cells elongate 8
- 8(7). Leaves long decurrent; all basal leaf cells and decurrent cells lax and inflated; leaf margins plane
 *B. auriculata* E. B. Bartram
- 8'. Leaves not decurrent, inner basal leaf cells long-rectangular to linear, firm to thick-walled, basal cells at margins lax and enlarged in 2–4 rows or firm to thick-walled and small; leaf margins recurved 9
- 9(8). Plants robust, leaves to 6–8 mm
 *B. karsteniana* (Carl Müller) A. Jaeger
- 9'. Plants medium- to large-sized, leaves 3–5 mm long 10
- 10(9). Leaves ovate-lanceolate, smooth, gradually and evenly narrowed above to tip; capsules furrowed 11
- 10'. Leaves ovate to broadly lanceolate, smooth or rugose, abruptly narrowed above to tip; capsules rugulose to nearly smooth 12
- 11(10). Branch and stem leaves closely spaced, erect and overlapping at base, stems not evident; leaves with small group of enlarged cells at basal angles, and with enlarged cells extending up the basal margin
 *B. chrysea* (Carl Müller) A. Jaeger
- 11'. Branch leaves (occasionally stem leaves) well spaced, spreading from the insertion, dark-red stems conspicuous; leaves with 1–2 enlarged cells at the extreme basal angles, otherwise alar cells undifferentiated
 *B. tomentosa* (Swartz ex Bridel) A. Jaeger
- 12(10). Alar cells weakly differentiated, 1–3 inflated cells at extreme basal angles and a few enlarged supra-alar cells *B. squarrosa* A. Jaeger
- 12'. Alar cells well differentiated, 4–9 rows of enlarged, firm-walled or inflated cells at basal angles, often extending up the basal margin in some leaves 13
- 13(12). Intramarginal alar cells non-porose, length to width 1–2:1
 *B. subarcuata* (Carl Müller) Schimper
- 13'. Intramarginal alar cells porose, length to width often more than 2:1
 *B. rhythidioides* Herzog

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